



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/982,475	10/17/2001	Adam T. Lake	10559-580001/P11134	7046

20985 7590 07/12/2004

FISH & RICHARDSON, PC  
12390 EL CAMINO REAL  
SAN DIEGO, CA 92130-2081

EXAMINER
----------

CUNNINGHAM, GREGORY F

ART UNIT	PAPER NUMBER
----------	--------------

2676

7

DATE MAILED: 07/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/982,475

Applicant(s)

LAKE ET AL.

Examiner

Greg Cunningham

Art Unit

2676

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. This action is responsive to communications of application filed 09/15/2003.
2. The disposition of the claims is as follows: claims 1-30 are pending in the application.

Claims 1, 7, 11, 17, 21 and 27 are independent claims.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 11 and 21 are rejected under 35 U.S.C. 102(b) as anticipated by Yanof et al., \*(US Patent 5,371,778), hereafter Yanof, or, in the alternative, under 35 U.S.C. 103(a) as obvious over Yanof and further in view of Ross et al., (US Patent 6,608,628 B1), hereafter Ross.

A. Claim 1, "A computer-implemented method of generating a shadow for a three-dimensional model having an infrastructure that includes a bone [col. 3, ln. 65 – col. 4, ln. 18], the method comprising: projecting the bone onto a surface [col. 5, lns. 10-12 and 54-58]; and generating the shadow on the surface based on a projection of the bone [col. 5, lns. 43-49; col. 7, lns. 54-64]" is disclosed by Yanof [as detailed].

In as much as Yanof teaches shadowing, shading, applicable to various tissue, Ross is more specific with regard to skull bone points on the inner surface, which shadow those on the outer surface of the object in col. 9, lns. 14-20.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply three-dimensional model projecting of bone disclosed by Yanof in combination with bone shadow on surface disclosed by Ross, and motivated to combine the teachings because it would provide for the “need for improvements upon such techniques, including improvements in image quality, new ways for users to interact with such images, and greater ease of use of biomedical image display systems” as revealed by Ross in col. 1, lines 46-50.

B. Per independent claims 11 and 21, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of independent claim 1, and therefore are rejected to independent claim 1.

5. Claims 7-10, 17-20 and 27-30 are rejected under 35 U.S.C. 102(a) as anticipated by Snyder et al. (US Patent 6,252,608 B1), hereafter Synder, or, in the alternative, under 35 U.S.C. 103(a) as obvious over Pieragostini et al. (US Patent 6,437,782 B1), hereafter Pieragostini, and further in view of Drebin et al. (US Patent 4,835,712), hereafter Drebin.

A. Claim 7, “A computer-implemented method of generating a shadow for a three-dimensional model [col. 13, lns. 46-49] having an infrastructure that includes a bone [col. 36, lns. 36-41: wherein leaf connecting nodes corresponds to skeleton structure of a living being “bones”]), the method comprising: generating a bounding volume for the bone [col. 36, lns. 37-41; col. 88, lns. 26-29]; and generating the shadow by projecting a shape of the bounding volume onto a surface [col. 88, lns. 20-29]” is disclosed by Snyder [as detailed].

Alternately claim 7, “A computer-implemented method of generating a shadow for a three-dimensional model having an infrastructure that includes a bone, the method comprising: generating a bounding volume for the bone; and generating the shadow by projecting a shape of the bounding volume onto a surface [shadow plane]” is disclosed by Pieragostini [in abstract and col. 4, lns. 1-9 and col. 7, ln. 59 – col. 6, ln. 4; col. 9, ln. 53 – col. 10, ln. 19, as detailed].

While Pieragostini does not describe “an infrastructure that includes a bone”, Drebin does in col. 1, lns. 40-52.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply projected bounding volumes of shadows disclosed by Pieragostini in combination with bounding volumes [voxels] with bones disclosed by Drebin, and motivated to combine the teachings because it would “produces shadows in real time without producing an image whose quality is compromised by less intense computations or other means” as revealed by Pieragostini in col. 3, lines 38-40.

B. Per independent claims 17 and 27, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of independent claim 7, and therefore are rejected to independent claim 7.

C. Claim 8, “The method of claim 7, further comprising locating a virtual light source [col. 1, lns. 57-62; col. 2, lns. 35-38; also see figs. 9A-C of Pieragostini] in an environment that the three-dimensional model inhabits; wherein projecting the shape comprises: drawing lines from the virtual light source, through locations on a surface of the bounding volume, onto the surface; and connecting points at which the lines intersect the surface [see figs. 9A-C of Pieragostini]” is disclosed supra by Pieragostini and Drebin for claim 7 [as detailed].

Art. Unit: 2676

D. Per dependent claims 18 and 28, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 8, and therefore are rejected to dependent claim 8.

E. Claim 9, “The method of claim 7, wherein generating the shadow further comprises mapping a texture onto the shape of the bounding volume projected onto the surface” is disclosed supra by Pieragostini and Drebin for claim 7 [as detailed by Pieragostini].

F. Per dependent claims 19 and 29, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 9, and therefore are rejected to dependent claim 9.

G. Claim 10, “The method of claim 7, further comprising receiving data that corresponds to a size and shape of the shadow; wherein the shadow is generated based on the data” is disclosed supra by Pieragostini and Drebin for claim 7 [as detailed by Pieragostini, see items 12’ and 24’ of figs. 1 and 2; item 30 of figs. 9A,E,F and G; and polygon A’B’C’G’F’E’ of fig. 9C for “size and shape of the shadow”, wherein polygons and figures represent data structures and data].

H. Per dependent claims 20 and 30, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 10, and therefore are rejected to dependent claim 10.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

Art. Unit: 2676

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2, 12 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanof and Ross as applied to claims 1 and 11 above, and further in view of Strandberg, (US Patent 6,054,999).

A. Claim 2, "The method of claim 1, further comprising locating a virtual light source in an environment that the three-dimensional model inhabits; wherein projecting the bone comprises: drawing lines from the virtual light source, through points on the bone, onto the surface; and connecting points at which the lines intersect the surface" is disclosed supra for claim 1.

Yet in as much as Yanof and Ross do not appear to disclose "further comprising locating a virtual light source in an environment that the three-dimensional model inhabits [col. 6, lns. 31-37 and col. 12, lns. 22-42, particularly lns. 34-42 <contemplated light source>]; wherein projecting the bone comprises: drawing lines from the virtual light source, through points on the bone, onto the surface; and connecting points at which the lines intersect the surface [col. 12, lns. 22-42, particularly lns. 34-42 <contemplated light source>]", Strandberg does [as detailed].

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply three-dimensional model projecting of bone disclosed by Yanof in combination with bone shadow on surface disclosed by Ross, coupled with contemplated light source taught by Strandberg, and motivated to combine the teachings because it would provide for the "need for improvements upon such techniques, including improvements in image quality, new ways for users to interact with such images, and greater ease of use of biomedical image display systems" as revealed by Ross in col. 1, lines 46-50.

Art.Unit: 2676

B. Per dependent claims 12 and 22, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 2, and therefore are rejected to dependent claim 2.

7. Claims 3, 4, 13, 14, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanof and Ross as applied to claims 1 and 11 above, and further in view of Analoui, (US Patent 6,405,071 B1).

A. Claim 3, “The method of claim 1, wherein generating the shadow comprises: creating a shape over at least part of the projection of the bone; and mapping texture onto the shape” is disclosed by Yanof and Ross *supra* for claim 1.

Yet in as much as Yanof and Ross do not appear to disclose “wherein generating the shadow comprises: creating a shape over at least part of the projection of the bone; and mapping texture onto the shape”, Analoui does in col. 8, lns. 5-8. Although Yanof does disclose “A volumetric region edited into a polygon with at least one oblique surface is illustrated in FIGS. 4 and 5. Rather than editing voxels based on spatial location, the operator can also edit voxels based on other criteria. For example, air, soft tissue, bone, and other types of imaged subject matter have CT numbers in distinct ranges” in col. 5, lns. 30-36, wherein air, soft tissue and bone correspond to different textured tissues.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply three-dimensional model projecting of bone disclosed by Yanof in combination with bone shadow on surface disclosed by Ross, coupled with texture taught by Analoui, and motivated to combine the teachings because it would provide for the “need for



Art.Unit: 2676

improvements upon such techniques, including improvements in image quality, new ways for users to interact with such images, and greater ease of use of biomedical image display systems” as revealed by Ross in col. 1, lines 46-50.

B. Claim 4, “The method of claim 3, wherein creating the shape comprises obtaining a polygon from the projection of the bone [Yanof – col. 5, lns. 30-32]” is disclosed supra for claim 4 and [as detailed].

C. Per dependent claims 13, 14, 23 and 24, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claims 3 and 4, respectively, and therefore are rejected to dependent claims 3 and 4.

8. Claims 5, 15 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanof and Ross as applied to claims 1 and 11 above, and further in view of George, III et al., (US Patent 6,175,655 B1), hereafter George.

A. Claim 5, “The method of claim 1, wherein mapping texture onto the shape comprises mapping a fuzzy texture onto edges of the shape” is disclosed by Yanof and Ross supra for claim 1.

Yet in as much as Yanof and Ross do not appear to disclose “wherein mapping texture onto the shape comprises mapping a fuzzy texture onto edges of the shape”, George does in col. 4, lns. 21-25; col. 6, lns. 1-15 and lns. 41-46; col. 16, ln. 52 – col. 17, ln. 5 and lns. 25-44; and col. 2, lns. 37-38. Wherein [fuzzy distance measure] and [fuzzy connectivity] corresponds to “mapping a fuzzy texture onto edges of the shape”.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply three-dimensional model projecting of bone disclosed by Yanof in combination with bone shadow on surface disclosed by Ross, coupled with fuzzy distance measure and fuzzy connectivity texture taught by George, and motivated to combine the teachings because it would “provide a method for isolating anatomical structures of interest such that surrounding tissue is not displayed along therewith. In this manner, the medical professional may view only the unobstructed anatomical structures of interest. This vastly reduces the complexity of the image and thus minimizes confusion as to precisely what portions of the image relate to the anatomical structure of interest” as disclose by George in col. 2, lns. 15-22.

B. Per dependent claims 15 and 25, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 5 and therefore are rejected to dependent claim 5.

9. Claims 6, 16 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanof and Ross as applied to claims 1 and 11 above, and further in view of Hishinuma et al., (US Patent 4,747,052), hereafter Hishinuma.

A. Claim 6, “The method of claim 1, further comprising receiving data that corresponds to a size and shape of the shadow; wherein the shadow is generated based on the data” is disclosed by Yanof and Ross supra for claim 1.

Yet in as much as Yanof and Ross do not appear to disclose “further comprising receiving data that corresponds to a size and shape of the shadow; wherein the shadow is generated based on the data”, Hishinuma does in col. 2, lns. 36-48 and col. 3, lns. 36-47.

Art. Unit: 2676

Wherein [blood vessel shadow] corresponds to “size of the shadow” and [blood vessel] correspond to “shape of the shadow”.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply three-dimensional model projecting of bone disclosed by Yanof in combination with bone shadow on surface disclosed by Ross, coupled with blood vessel shadow taught by Hishinuma, and motivated to combine the teachings because it would “desired to improve the contrast, sharpness and granularity by image processing” as disclosed by Hishinuma in col. 1, lns. 29-30.

B. Per dependent claims 16 and 26, these are directed to a machine-readable medium and apparatus, respectively, for performing the method of dependent claim 6 and therefore are rejected to dependent claim 6.

### ***Responses***

10. Responses to this action should be mailed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231. If applicant desires to fax a response, (703) 308-9051 may be used for formal communications or (703) 308-6606 for informal or draft communications.

Please label “PROPOSED” or “DRAFT” for informal facsimile communications. Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

When making claim amendments, the applicant is encouraged to consider the references in their entirety, including those portions that have not been cited by the examiner and their equivalents as they may most broadly and appropriately apply to any particular anticipated claim amendments.

Art Unit: 2676

***Inquiries***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Greg Cunningham whose telephone number is (703) 308-6109.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella, can be reached on (703) 308-6829.

**Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks

Washington, D.C. 20231

**or faxed to:**

**(703) 872-9306 (for Technology Center 2600 only)**


Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

*J.F. Cunningham*

gfc

June 28, 2004

  
**Kee M. Tung**  
**Primary Examiner**